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Remarks

Claims 44-59 are pending in the present application. Claims 44, 49, 50, 55, 56, 58 and 59 have been amended. Moreover, claims 45, 46 and 47 have been canceled.

Support for the amendment to claim 44 can be found in (now canceled) claim 47. Support for the amendment to claims 44 and 56 is further found in at least paragraphs 60, 73, Figs. 4A, 6A, 6B of applicant's corresponding U.S. Pat. Pub. No. 2002/0030163. Support for the amendment to claims 49, 55 and 58 can be found in applicant's specification for example, at paragraphs 4 and 45 of applicant's corresponding U.S. Pat. Pub. No. 2002/0030163.

Claims 50 and 59 are amended herein for purposes of clarity and consistency.

Initially, the applicant would like to thank the Examiner for the early indication of allowable subject matter of dependent claims 49 and 58. The applicant has not amended the claims to rewrite dependent claims 49 and 58 into independent form at this time as the applicant believes that the base independent claims from which claims 49 and 58 depend, as amended herein, recite allowable subject matter.

The applicant would also like to thank the Examiner for his time and effort participating in the telephone interview on November 15, 2006, which is summarized below.

Interview Summary

On November 15, 2006, Thomas Lees on behalf of the applicant, conducted a telephone interview with Examiner Lee. No demonstrations were utilized. Additionally, no exhibits or proposed amendments were transmitted to the Examiner. Claims 44, 45 and 47 were discussed in general terms. Additionally, the art of record including U.S. Patent No. 5,035,472 to Hansen, U.S. Patent No. 5,497,266 to Owen and U.S. Patent No. 6,335,526 to Horn were discussed. Specifically, the systems taught by Hansen, Owen and Horn were

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discussed and applicant compared and contrasted their disclosures with regard to claims 44, 45, and 47, the details of which are included as part of the arguments presented in this paper. No agreements were reached between the parties.

Claim Objections

Claims 47, 52 and 56 were objected to because of some informalities noted by the Examiner. Claim 47 has been canceled herein. With regard to claim 56, the recitation of a "common beam splitter" has been amended to recite "beam splitter" per the Examiner's recommendation.

The applicant respectfully traverses the Examiner's objections to claim 52. The applicant believes the chosen claim language to be clear and definite when the claim is read as a whole. Moreover, the claim language provides at least a reasonable degree of particularity and distinctness, thus meeting statutory requirements. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the Examiner might desire.

To illustrate, the Examiner recommends that the recitation of "a first electronic output derived from said first image" be amended to recite "a first electronic output from said first sensor representative of said first image". It is possible that the first electronic output is further filtered or otherwise modified, such as by corresponding electronics. A few non-limiting and illustrative examples are given in the applicant's specification with regard to image processing, including performing image brightness, contrast, focus, pseudo-color image processing, pattern recognition, pixel-by-pixel addition, subtraction, convolution, and image enhancement¹. If the electronic output is so modified, e.g., zoomed, cropped, etc., it may be unclear whether it is still "representative of" the first image. However, regardless of whether

¹ See for example, paragraphs 86, 87 of the applicant's U.S. Pat. Pub. No. 2002/0030163 A1.

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the electronic output is filtered, modified or otherwise processed, it is still derived from the first image. The remainder of the Examiner's suggestions are similar to that above, and thus the applicant's arguments apply by analogy.

In view of the amendments and clarifying comments, the Applicant respectfully requests that the Examiner withdraw the claim objections.

35 U.S.C. § 112, first paragraph

Claim 59 stands rejected under 35 U.S.C. § 112, first paragraph. The Examiner argues that the recitation of "said display and said viewer are arranged such that optical fusion via said third optical output and electronic fusion via said third electronic output can be viewed either simultaneously or individually" is unsupported by the specification. The applicant has amended this claim to more clearly recite that the viewer (which may be used to view at least one of a first optical output, a second optical output or a third optical output) and the display device (which may be used to display at least one of a first electronic output, a second electronic output or a third electronic output) are arranged such that optical fusion can be viewed on the viewer simultaneously with electronic fusion on the display device or optical fusion on the viewer and electronic fusion on the display can each be viewed individually.

Support for the clarifying amendment can be found, for example, in Fig. 6A and 6B and corresponding description at paragraphs 73-79 of applicant's published application U.S. Pat. Pub. No. 2002/0030163 A1. For example, Fig. 6A illustrates an exemplary arrangement wherein a sensor assembly provides both an optical view of the target image, e.g., via optical viewer 102A, as well as an electronic view of the target image, e.g., via display 141².

² See for example, paragraph 73 of the applicant's U.S. Pat. Pub. No. 2002/0030163 A1.

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35 U.S.C. §102(b)

Claims 44 and 48 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Pat. No. 5,035,472 to Hansen (hereinafter "*Hansen*"). Claim 44 has been amended herein to include the limitations similar to claim 47, which is canceled herein. Further, claim 48 depends from claim 44. As such, the rejections under 35 U.S.C. §102(b) are moot.

35 U.S.C. §103(a)

Claims 44 and 48 were rejected under 35 U.S.C. §103(a) as being obvious in view of *Hansen*. Claims 45-47 were rejected under 35 U.S.C. §103(a) as being obvious over *Hansen* in view of U.S. Pat. No. 5,497,266 to Owen (hereinafter "*Owen*"). Claims 50-53 were rejected under 35 U.S.C. §103(a) as being obvious over *Hansen* in view of U.S. Pat. No. 6,335,526 to Horn (hereinafter "*Horn*") and claims 54-57 were rejected as being obvious over *Hansen* in view of *Owen* and *Horn*.

As noted above, claim 44 has been amended herein to include the limitations similar to claim 47. Moreover, claim 47 has been canceled.

According to the M.P.E.P. §706.02(j), to establish a *prima facie* case of obviousness, the prior art reference must teach or suggest all the claim limitations. It is the applicants' position that the art does not support the rejections to the claims as amended herein, thus a *prima facie* case of obviousness has not been established. Accordingly, the applicants respectfully request that the rejections are withdrawn.

For example, claim 44, as amended herein, recites:

...a beam splitter arranged to receive the target radiation passed through the common aperture and to split the target radiation into a first spectral band and a second spectral band which is different from the first spectral band ... wherein the target radiation in the first spectral band is directed along a first optical path

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and the target radiation in the second spectral band is directed along a second optical path

...
a first sensor arranged to receive the radiation in the first spectral band
... a first objective lens in the first optical path between the beam splitter and the first sensor, wherein the first objective lens is transmissive to radiation in at least a portion of the first spectral band

...
a second sensor arranged to receive the radiation in the second spectral band ... a second objective lens in the second optical path between the beam splitter and the second sensor, wherein the second objective lens is transmissive to the radiation in at least a portion of the second spectral band

...
wherein the target radiation is not filtered by any objective lens until after being split into the first optical path and the second optical path...

In support of the rejection of claims 44 and 47, the Examiner argued that optics such as aberration correcting lenses for night vision technology are well known in the art, citing the aplanarity of the secondary reflector and simple meniscus lens 56 taught in *Owens* in support thereof. The Examiner thus concluded that it would be obvious to one of ordinary skill in the art to provide aberration correction lenses in the optical system of *Hansen* in order to correct aberrations³.

However, none of the cited art teaches or suggests the use of a beam splitter that splits the target radiation into a first optical path and a second optical path, a first objective lens in the first optical path between the beam splitter and a first sensor, a second objective lens in the second optical path between the beam splitter and a second sensor, wherein the target radiation is not filtered by any objective lens until after being split into the first optical path and the second optical path.

³ See the Office Action mailed 10/16/2006, page 7.

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Hansen discloses two embodiments. In a first embodiment, a common objective lens 14A is positioned just behind a sighting window 15 and is positioned in the optical path before a beam splitter 16A. Thus, the objective lens 14A defines a common objective lens that must filter the radiation that eventually travels to both the focal plane array 24 and the I² tube 28⁴.

In a second embodiment, radiation passing through the sighting window is directed by a multispectral beam splitter 58 onto a parabolic reflector optic 60 and is retroreflected from the reflector optic along a *single optical path* through an objective lens 62. Radiation filtered by the objective lens 62 is reflected by a mirror along a common objective optical axis 19 toward a first partially reflective beam splitter 16A⁵. Notably, the radiation is not split into first and second spectral bands as claimed, until after the radiation passes through the common objective lens 62 and the beam splitter 16A.

Thus, *Hansen* fails to teach or suggest separate objective lenses in each optical path. Moreover, *Hansen* fails to teach or suggest an optical system where target radiation passes through a beam splitter that splits the radiation into first and second optical paths, wherein the target radiation is not filtered by any objective lens until after being split into the first optical path and the second optical path.

Owen teaches a common objective lens system as well. See for example, objective lens 14 in Fig. 2, objective lens 114 in Fig. 3 and objective lens 214 in Fig. 4 as the first optical element in the optical path. The objective lens is thus common to each optical path in the various disclosed optical systems⁶.

⁴ See for example, *Hansen*, Fig. 4, Col. 3, lines 10-28.

⁵ See for example, *Hansen*, Fig. 5, Col. 4, lines 31-45.

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Thus, *Owen* fails to teach or suggest an optical system where target radiation passes through a beam splitter that splits the radiation into first and second optical paths, wherein the target radiation is not filtered by any objective lens until after being split into the first optical path and the second optical path.

Moreover, the use of *aberration correction*, such as to correct for astigmatism and flattening of the visual field as taught in *Owen*⁷, neither teaches nor suggests the use of a separate *objective lens* in each of the first and second optical paths. In practical implementations of the systems taught in *Owen*, separate aberration correction is required because the common objective lens cannot compensate for all aberrations across both wavebands. Thus, with one, common objective lens is in the front, correction lenses are required for two different optical paths (wavebands).

However, merely correcting for aberrations in a filtered waveband is completely different from providing *a separate objective lens* in each optical path. For example, each objective lens includes a focal length, an f number, field of view (FOV), a Modulation Transfer Function (MTF), a back working distance, etc.⁶. Thus, in the claimed invention, each optical path can be customized with different or similar parameters. Thus, each optical path can comprise, for example, an independent channel for optical and/or electronic processing.

In contrast, in each of *Hansen* and *Owen*, a single objective lens is used for the entire system. Thus, each optical path is bound and limited to the same field of view, focal length, etc. Moreover, the optical paths are constrained by the efficiency and optical characteristics of a single objective, which is required to be transmissive of a wide band of wavelengths.

⁶ See for example, *Owen*, Col. 4, lines 10-24.

⁷ See for example, *Owen*, Col. 6, line 64 through Col. 7, line 3.

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Further support and illustration of the differences between the claimed invention and the cited prior art can be found in the accompanying Rule 1.132 affidavit provided by Evan Zhang, Ph.D.

The applicant truly appreciates the time and additional energy that is required by both the Examiner and the corresponding primary Examiner to review the additional affidavit pursuant to the requirements of MPEP §716.

In view of the amendments and clarifying comments herein, as well in as in the included affidavit, the applicant respectfully requests that the rejection to claim 44 and the claims that depend therefrom be withdrawn.

With regard to claim 52, *Hansen* in combination with Horn fail to teach or suggest:

a first sensor arranged to receive radiation in a first spectral band and provide a first image of the radiation filtered into the first spectral band...a first optical output derived from the first image...a first electronic output derived from the first image

...

a second sensor arranged to receive radiation in a second spectral band and provide a second image of the radiation filtered into the second spectral band...a second optical output derived from the second image...a second electronic output derived from the second image

...

a beam combining device arranged to optically fuse the first optical output and the second optical output into a third optical output...a viewer for viewing at least one of the first optical output, the second optical output or the third optical output...a processor arranged to electronically fuse or combine the first electronic output and the second electronic output into a third electronic output...a display device arranged to selectively display at least one of the first electronic output, the second electronic output or the third electronic output;

⁸ See for example, paragraph 49 of the applicant's U.S. Pat. Pub. No. 2002/0030163 A1.

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Hansen discloses a system that allows a user to selectively switch an optical output between different channels. However, there is no teaching or suggestion of providing both optical and electrical outputs from any of the disclosed channels. Further, *Horn* discloses electronic fusion from two different uncooled detectors. However, there is no teaching or suggestion of any optical outputs at all. Thus, neither *Hansen* nor *Horn* teach or suggest providing electronic and optical outputs from a first sensor and from a second sensor.

Horn Arguably Teaches Away from Optical Fusion

Horn discloses a long wave sensor (LWS) and a short wave sensor (SWS) that each comprise a focal plane array and electronics for converting radiation impinging on the FPA to appropriate signals which may be displayed on a suitable screen display 15⁹.

However, the display 15 is required to provide further functionality of the disclosed system, which includes the display of an electronic compass, ground positioning sensor data (GPS), data input for other signals from a CPU, radio/video link, etc.¹⁰

Further, with specific regard to the SWS sensor, *Horn* teaches the use of a SWS sensitive detector surface is in the 1-2 micron band, which is able to see reflected light present from the nightglow effect. *Horn* asserts that the SWS can see battlefield lasers since these lasers operate at 1.06 and 1.54 microns, respectively, where image intensifiers cannot see these wavelengths¹¹. Thus, *Horn* apparently intentionally avoids optical devices such as intensifiers etc., which are described and utilized in *Hansen*.

⁹ See *Horn*, Col. 2, lines 35-42.

¹⁰ See for example, *Horn*, Col. 2, lines 42-46; Col. 3, lines 54-62.

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The Art of record Fails to Establish a *Prima Facie* Case of Obviousness

The applicants assert that the art of record fails to establish a *prima facie* case of obviousness because the references themselves, the nature of the problem being solved and the level of ordinary skill in the art are insufficient to provide the suggestion or motivation to combine the references in such a way as to teach the claimed invention as a whole¹².

The Examiner essentially argues that *Hansen* teaches optical fusion, *Horn* teaches digital fusion, thus it would be obvious to combine the references "for automated target recognition which can be displayed and/or transmitted together with other relevant information to a command and control center."

However, when considering the invention *as a whole*, there would be no motivation to combine *Horn* and *Hansen*. For example, *Hansen* discloses a sight for a rifle. *Horn* discloses a goggle system. Fig. 1 of *Hansen* clearly illustrates that the disclosed optics-only system is already of significant size. Moreover, since the system taught in *Hansen* is clearly a monocular rifle sight, there is no teaching or suggestion as to how a viewer for optics and a separate display screen for the electronics that the Examiner wants to add on from *Horn* can be fitted so as to not defeat the designed for purpose of the rifle sight. For example, there is no teaching or suggestion in either reference of combining an optical viewer and display in such a way that avoids parallax, etc.

As noted above, *Horn* explicitly teaches against the use of an image intensifier. Moreover, there is no teaching or suggestion in either reference of a system that provides both an electronic output image and an optical output image that are both derived from the same sensor output. Moreover, none of the cited references teach or suggest how simultaneous

11 See for example, *Horn*, Col. 3, lines 17-38.

12 M.P.E.P. §2143; §2143.01.

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optical and electronic sensor fusion can be achieved. For example, none of the cited references teach or suggest that optical sensor fusion can be achieved simultaneously with electronic sensor fusion in such a way that there would not be image blurring and/or other artifacts between the optically fused image seen at the viewer and the electronically fused image on the display.

For example, there is no teaching, suggestion or motivation in the cited references that would indicate how the goggle mounted display of *Horn* could be used with an optical eyepiece rifle site of *Hansen* without defeating the utility of each separate invention. For example, each optical system disclosed in *Hansen* and in *Horn* require intimate positioning of the user's eye with the optical eyepiece (*Hansen*) and the goggle mounted display screen (*Horn*).

Moreover, there is no teaching or suggestion as to how to address and resolve differences in optics and display electronics, such as latency, issues of differences in pixel sizes, pixel numbers, and focal plane array formats of the electronic images. There is no teaching or suggestion as to how to perform pixel interpolation, scaling, offsetting or other necessary electronic processes in real-time so that the image provided at a hypothetical optical eyepiece corresponds with the image at the display screen. Thus, one would not be motivated to combine the references as the Examiner suggests.

Size and weight are further identified in *Hansen* as areas for concern, citing the adverse affects of size and weight on successful military missions¹³. Similar concerns are echoed in the electronic fusion system of *Horn*. Thus, again, there would be no motivation to combine these references as each reference would have to be modified to include substantial additional components. For example, in *Horn*, each channel is processed electronically using

¹³ See for example, *Hansen*, Col. 1, lines 29-35.

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a focal plane array and electronics for converting radiation impinging on the FPA to appropriate signals. As such, to get an optically fused image to an eyepiece would require the addition of two more display screens to convert each channel to an optical signal, a beam combiner to optically fuse the new optical images, and an eyepiece to view the optically fused image. The Examiner does not indicate how such can be accomplished without destroying the intended use of *Horn*. Similar arguments apply by analogy to the rifle sight taught in *Hansen*.

Still further, there is no teaching or suggestion that the limited field of view that can be achieved with a system as taught by *Hansen*, which is specifically designed for boresighting on a rifle, would be of suitable "for automated target recognition which can be displayed or transmitted to a control center" or is otherwise suited for a goggle system that has been designed to allow for driving vehicles as taught by *Horn*¹⁴.

Impermissible Hindsight

The applicants' assert that the art of record does not support the motivation to combine the references, and at best, only suggests the impermissible form of hindsight reconstruction, rather than establishing an objective assessment of the claimed invention as a whole, without the benefit of the applicants' disclosure. Impermissible hindsight must be avoided, even where the suggestion or motivation to combine the references is based upon the ordinary skill in the art¹⁵. In this regard, it is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher. In other words, the factual question of motivation cannot be resolved on 'subjective belief' and 'unknown authority' ¹⁶."

¹⁴ See for example, *Horn*, Col. 2, lines 54-58.

¹⁵ M.P.E.P §2142; M.P.E.P §2145.

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The art of record fails to establish that a person skilled in the art already had an incentive or reason to combine or modify the references in the way that the inventor did. There is no objective evidence in the Office action that establishes an incentive for the combination of optical fusion and electronic fusion.

Accordingly, the applicant respectfully requests that the rejection to claim 52 and the claims that depend therefrom, under 35 U.S.C. §103(a) be withdrawn.

Conclusion

The Claims are amended herein to address objections and other matters of form raised by the Examiner. No new matter is believed to be added.

For all of the above reasons, the applicant respectfully submits that the above claims recite allowable subject matter. The Examiner is encouraged to contact the undersigned to resolve efficiently any formal matters or to discuss any aspects of the application or of this response. Otherwise, early notification of allowable subject matter is respectfully solicited.

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16 M.P.E.P §2145: *W.L. Gore v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983).